

DR NOOTH AND HIS APPARATUS

The role of carbon dioxide in medicine in the late eighteenth century

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SUMMARY

The two earliest inhalers devised for the administration of ether anaesthesia in the U.K. (Hooper's and Squire's apparatus) both incorporated the bottom part of a Nooth's apparatus. This, which was once a household object, is now remembered only as a footnote in one or two specialist histories, and Nooth himself, who was a most distinguished and respected medical man in his day, is almost completely forgotten. Yet there are many aspects of Nooth's life that are of great interest, and his apparatus was one of the very first to be designed to produce, for medicinal purposes, what may inclusively be called carbonated waters; and, surprisingly, there are strong links of coincidence between the histories of artificial mineral waters and of anaesthesia, and the personalia involved in each.

During the 16th century there was a resurgence in the popularity of naturally occurring mineral waters, which appear to have been used for medicinal purposes since pre-historic times, and they attracted the attention of such notable investigators as Paracelsus, Van Helmont, Robert Boyle and Friedrich Hoffman (Partington, 1961)^{1*}. At first, research was directed to their saline constituents (Debus, 1965)², and achieved such results that Francis Bacon found it strange, considering how mineral waters were being extolled, "... that no man hath sought to make an imitation by art of natural baths and mineral fountains..." since by varying the composition it should be possible to control the effect (Bacon, 1605)³.

The gaseous constituent of these sparkling or effervescent waters was less easily determined. Van Helmont had described a "spiritus mineralis", and this haunted research for the next hundred years. Then in 1755 Joseph Black (1728-99) investigated the effect of heat and acids on magnesia alba and limestone, and showed that an elastic fluid, to which he gave the name "fixed air", was given off (Black, 1756)⁴. The following year his observation that "creams or crusts" developed at the surface of lime-water when it was exposed to the air led him to evolve the lime-water test for carbon dioxide, and he showed

that this gas is present in the exhaled air and in mineral waters. Some 15 years earlier, William Brownrigg (1711-1800), in a paper read before the Royal Society, expressed the view that the hitherto mysterious "spiritus mineralis" was identical with the "choak damp" of mines and the "mephitic exhalations" of the Grotto del Cane at Naples. Twenty-five years later he was able, while on holiday at the famous Belgian health resort that has provided the generic name for all the others, Spa, to extract a "permanently elastic fluid" from Spa water, and to demonstrate its mephitic effects on a mouse and a green wagtail, both of which succumbed very quickly. He also showed that similar effects are produced by the gas that is generated during the fermentation of beer and spirits. Thus he established by their biological effects that the three gases, of mineral waters, fermentation and mines, were identical, and these findings were communicated to the Royal Society in 1765 (Brownrigg, 1765)⁵.

JOSEPH PRIESTLEY

Among the Fellows of the Royal Society who read Brownrigg's paper with interest was Joseph Priestley (1733-1804). Priestley, of course, is celebrated in our own specialty as the discoverer of nitrous oxide, and, in competition with Scheele and Cornelis Drebbel, oxygen; but few anaesthetists seem to know that he has an equally strong claim to be recognized as the founder of the soft drinks industry and, from his proposal to revive flat ale by impregnating it with fixed air, as the inventor of keg beer! (Priestley, 1775)⁶.

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* *Editorial Note:* Because Dr Zuck has included extensive notes in his reference list, we are departing from the usual practice of the Journal and retaining his superscript numerical identification, which takes priority over authors' names in the order of references.

In 1767, at the time that he read Brownrigg's paper, Priestley was living in Leeds, next door to a large brewery, and, realizing that large volumes of carbon dioxide—to use the modern term—were being generated there continuously, he was struck with the idea of making Spa water artificially. He did this at first by leaving saucers of water exposed overnight in the atmosphere of carbon dioxide near the vats, and, as he says, "I generally found the next morning that the water had acquired a very sensible and pleasant impregnation; and it was with peculiar satisfaction that I first drank this water, which I believe was the first of its kind that had ever been tasted by man." He was later to make a similar remark about oxygen.

About 4 years later, in 1771, Priestley devised an apparatus for the domestic preparation of artificially impregnated water by chemical means, and in 1772 he published a pamphlet describing how to use it. This pamphlet created some considerable interest, and it was soon published in translation in France. One of Priestley's apparatuses was taken by Captain Cook on his second voyage (1772-75), to test the value of impregnated water as a preventive of scurvy. The theory behind this will be mentioned later. For the present it should be observed that Priestley's objective

was to make the water widely available for medicinal purposes, and to encourage this application he persuaded his friend Thomas Percival, the eminent Manchester physician, to carry out some clinical trials. These, also, will be mentioned later.

Priestley's apparatus is shown in figure 1. Carbon dioxide is generated in bottle *e* by the action of oil of vitriol (sulphuric acid) on a mixture of chalk and water. The gas is collected in the bladder *d*, and is then squeezed through the curved tube *c* and dissolved in the water in bottle *a* by frequent agitation. If there is any objection to the bladder it can be replaced by the small phial *a*, which serves as a trap for any chalk or water that might be thrown up by the violence of the reaction. To speed up the process two bladders may be used, one being filled while the contents of the other are being expelled into the water. It should be pointed out, because it has some later relevance, that these bladders were actual animal bladders (pig or ox), preserved and kept flexible by treatment with oil.

JOHN MERVIN NOOTH

On December 15, 1774 a paper entitled "The Description of an Apparatus for impregnating Water with fixed Air" was read at the Royal Society. The author was John Mervin Nooth, M.D., F.R.S. Nooth came to be recognized by his contemporaries as one of the most distinguished medical men of his day, and for a time his name was almost a household word, but largely because of his modesty and his self-effacing nature he is now almost completely forgotten. He does not appear in the *Dictionary of National Biography*, and his name will be found in only one of the standard biographical reference books, *Johnston's Roll*. With this as a starting point, however, it has been possible, by a process of detection, guesswork and good luck, and with help from archivists and librarians, to establish the facts about Nooth's life in outline, and to fill in the details of two periods. Some of this detail, however, while of great interest for the light it throws on certain aspects of medical life in the late 18th and early 19th centuries, is not relevant to the present subject, and will be mentioned in brief only.

Nooth's father, Henry, was born in 1712, the son of the Reverend Mr Nooth, Prebendary of Wells, Somerset. In 1732, when he married Bridget (Biddy), younger daughter of John Mervin, apothecary, of Sturminster Newton, Dorset, he, too, was described as an apothecary, so it may be assumed that he was apprenticed to John Mervin before his marriage. Biddy inherited property from her father, who died in the

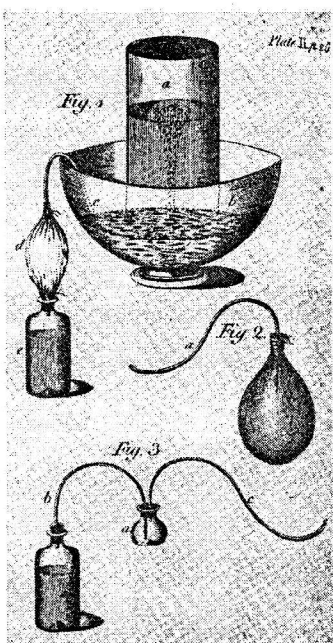


FIG. 1. Priestley's illustration of his apparatus.

following year, and the Nooths remained in Sturminster Newton, where their son, John Mervin Nooth, was born on September 5, 1737⁷.

John Mervin Nooth graduated M.D. at Edinburgh in 1766. His name appears on a class list of William Cullen's in 1763, but by analogy with others about whom more is known it is likely that he commenced his studies in the previous year. He would then have been 25 years of age and, again by analogy, it is probable that he had served an apprenticeship for about 5 years, perhaps with his father. He graduated with a thesis on rickets, "De Rachitide", and his signature, dated July 31, 1766, appears on the graduation register (fig. 2)⁸ immediately below that of William Withering. From our knowledge of Withering's life in Edinburgh we can get some idea about Nooth's; but although they must have gone through medical school together there is circumstantial evidence that they were not friends (Peck and Wilkinson, 1950)⁹.

Although Joseph Black did not move from Glasgow to Edinburgh until 1766, Nooth was undoubtedly acquainted with his work on fixed air, and this seems to have created a lasting interest, for we find the Honourable (later Sir) William Hamilton, His Majesty's Envoy Extraordinary at Naples, writing, at a time when his first wife was happily still alive, to Matthew Maty, M.D., Secretary of the Royal Society, and relating that, "From some experiments very lately made, by the ingenious Dr Nuth, on the mofete of Grotto del Cane, it appears that all its known qualities and effects correspond with those attributed to fixed air" (Annual Register, 1772)¹⁰.

That Nooth, son of a country apothecary, was able to go on the Grand Tour, and his brother Henry was able to purchase first a commission and then progressive advancement in a very fashionable regiment, the 4th Dragoons, and to marry into the landed gentry, is evidence of more wealth and social status than is usually attributed to the apothecary in the 18th century, and there is something of a mystery here. Apart from his stay in Naples we have no information about Nooth's itinerary on the Grand Tour. He had returned to London by 1773, and a paper was read by him at the Royal Society on June 24. He was living in Bond Street at this time, probably in lodgings, since his name does not appear in the Rate Books. He clearly had no intention of engaging in civilian medical practice, since he was not, and never became, a licenciate of the Royal College of Physicians, which qualification was a legal requirement for such practice, yet he was able to live for several years in a neighbourhood that was clearly aristocratic, and to engage in expensive scientific activities.

In his paper of June 1773, which is described as "An Extract of a Letter from Dr Nooth to Dr Franklin, F.R.S., on some Improvements in the Electrical Machine", Nooth carefully analyses the construction and working of a machine which was essentially a device for building up a static charge by rotating a large glass bottle lying on its side, against rubber flaps. He notes the weak points in the design, and describes a method of preventing leakage of the charge and increasing the potential generated, regardless of the humidity of the atmosphere, by improved insulation. The machine that he was improving may

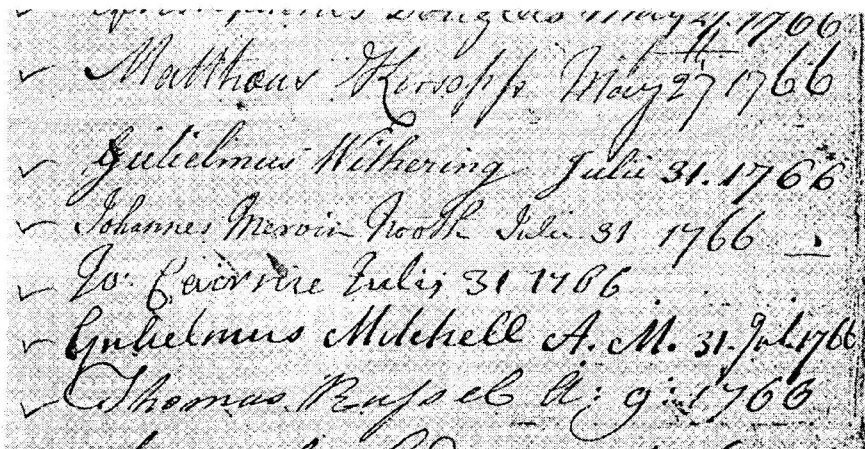


FIG. 2. The graduation register for 1766, Edinburgh Medical School. (By courtesy of the Keeper of Manuscripts.)

have been designed by Priestley, who published his "A familiar introduction to the study of Electricity" in 1769, for on page 85 of this book we read that "Machines like that described [in the book] are made by the direction of Dr Priestley, and may be had by giving Orders to Mr Johnson, Bookseller, in Paternoster Row"¹¹. On the strength of this paper Nooth was elected a Fellow of the Royal Society, being admitted on March 24, 1774, on payment of 31 guineas. Among his sponsors, who recommended him as "a gentleman and personal acquaintance", were William Hunter and Benjamin Franklin¹².

The paper in which Nooth described his apparatus for the impregnation of water with fixed air was read at the Royal Society on December 15, 1774 (Nooth, 1775)¹³. In the introduction he makes it clear that his purpose is to promote the study of the medical effects of fixed air united with water, a subject that he had clearly been interested in for some years. He gives Priestley credit for being first in the field, and mentions that the use of Priestley's apparatus has resulted in some very successful cures of disease, but, he continues, the experiments have not been as numerous as one could have wished. He attributes this partly to the difficulty that anyone lacking Priestley's experience and dexterity would find in using his apparatus, and it is to overcome this that he has designed his own.

But Nooth also makes the more serious complaint that the bladder attached to Priestley's apparatus imparts a urinous taste to the water, and this was sometimes so pronounced that it could not be drunk. Priestley was deeply offended by this criticism, and the implication that he could not tell the difference, and counterattacked vigorously in true 18th century style. He had never noticed a urinous taste himself, he said, nor had any of his friends, all of them people of the most delicate sensibility, so the taste could not possibly have come from the bladder. "Few people have had to do with bladders, and fixed air confined in bladders, more than myself . . ." The reason must be sought elsewhere. Dr Nooth should repeat his experiment, for he could only suggest that any urinous taste must have been the result of an unsolicited contribution from Nooth's servant! Yet one is left wondering about the sensitivity of Priestley's taste buds, since both Brownrigg and Withering commented on the taste added to the water by the bladders (Priestley, 1775)¹⁴.

Nooth's apparatus is shown in figure 3. The most immediately striking feature is the modernity of its design. It consisted of three glass vessels fitted

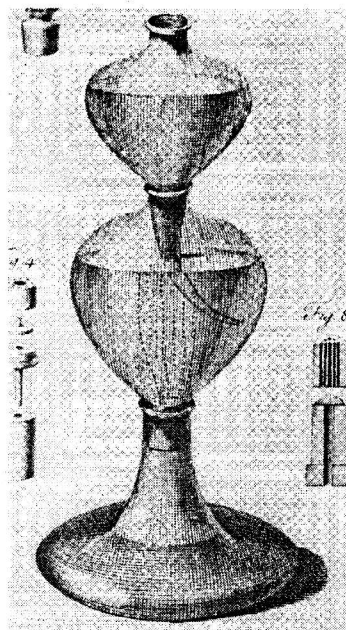


FIG. 3. Nooth's illustration of his apparatus.

together with air-tight joints, and being all glass there was of course no question of contamination. The lowest vessel contained the reacting chemicals, and was connected to the middle container, which held the water or solution which was to be impregnated, by an ivory valve mounted in cork, which allowed the carbon dioxide through, but prevented the water from escaping. This valve also allowed the two upper vessels to be detached from the lower for agitation. The highest vessel served to receive water displaced by the ascending carbon dioxide, and functioned also as a seal. Once the correct amount of chalk and sulphuric acid had been found by trial and error, a volume of carbon dioxide could be generated adequate to impregnate the water, but just insufficient to cause it to overflow from the upper vessel. For full impregnation it was necessary to repeat the process four or five times, adding fresh chalk on each occasion. The similarity of the principle to the Kipps apparatus, and even to the Cona coffee percolator of today will be recognized. As far as can be ascertained, the principle originated from Nooth.

In his account of his apparatus Nooth describes only the method of impregnating water with fixed air, but he mentions that "many curious experiments may be made with it, both in chemistry and phar-

macy". By adding the appropriate salts to the water in the middle vessel he had been able to imitate very perfectly the common mineral waters, and he had also made aqueous solutions of substances previously thought to be insoluble. Unfortunately he gives no details of these experiments, reserving them, he says, for a future paper, which does not seem ever to have been presented.

Compared with Priestley's apparatus, Nooth's takes an enormous step forward; it is beautifully integrated, functional in design, and even aesthetically pleasing. One can imagine the 18th century housewife objecting strongly to having Priestley's apparatus, complete with bladder, on her side-board, but proudly displaying the new apparatus of Dr Nooth. Its appearance and ease of use must have contributed to its acceptability, and hence to its influence. Even Priestley came to recognize its merits. He gave it rather grudging approval in his "Experiments and Observations" of 1775, and he dropped all reservations in the revised edition of 1790, saying that he had never recommended his own apparatus for domestic use after becoming acquainted with Dr Nooth's¹⁵.

Nooth's apparatus clearly aroused considerable interest, and, no different from medical apparatus today, it was soon produced with various modifications. These were intended either to speed up the

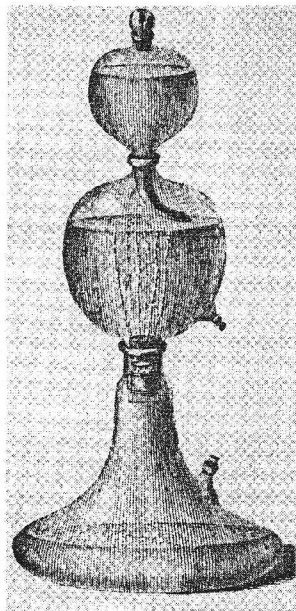


FIG. 4. Mr Parker's modification of Nooth's apparatus.

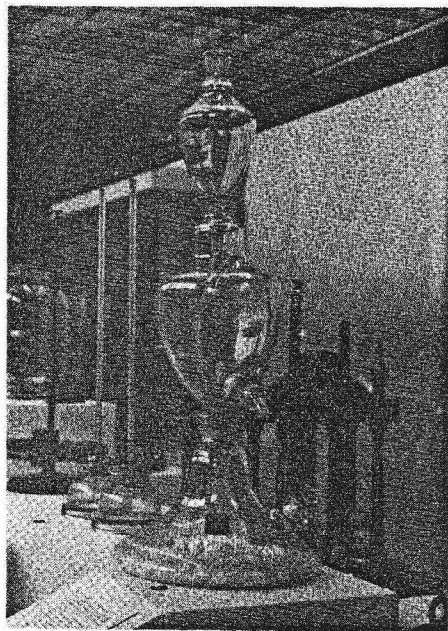


FIG. 5. Nooth's Apparatus—Mr Blade's modification. Science Museum, London. H. M. King George III Collection.

process, or to overcome certain technical difficulties, such as a tendency for the upper vessel to explode. Thus Priestley's friend and benefactor Mr Parker, who was an instrument maker in Fleet Street¹⁶, modified it to ensure that the water could not overflow the upper vessel, so that continuous attention was no longer necessary. He also added a channelled stopper to allow air to escape from the upper vessel as it filled with water displaced by carbon dioxide from the middle one, so preventing a dangerous increase of pressure. Finally, he provided separate stoppered openings in the middle and lower vessels, so that it was possible to add chalk, or, as recommended by Benjamin Franklin for its much longer reaction, pounded marble, and to draw off water in order to taste it occasionally without interrupting the process (fig. 4).

Further modifications were made by Priestley's Portuguese friend, Mr Magellan, who used a double set of middle and upper vessels, so that, as he says, in words that bear such a different connotation today, one might be agitated while the other was being impregnated; and by a Mr Blade, who altered the shape of the middle vessel in order to speed up the process by exposing a larger volume of water to the

fixed air (fig. 5). Priestley himself inspired his friend, the chemical lecturer John Warltire, to carry out the ultimate modification, which was to pressurize the whole apparatus, and so increase the carbon dioxide content, and the "sparkle", of the water. This was done by removing the stopper from the upper vessel and connecting it to a mercury manometer.

Thus Nooth, by availing himself of the analyses of the mineral constituents worked out by Hoffman and others, had been able, according to his claim, to "imitate very perfectly" the common mineral waters, by using a solution of salts in the middle vessel. Priestley, on the other hand, had merely impregnated plain water with carbon dioxide, but had not attempted to produce artificial mineral water.

An important modification to the constituents was made by another of Priestley's friends, Richard Bewley, who was an apothecary at Great Massingham. He dissolved a small quantity of carbonate of soda in the water before impregnation and so invented what became known as "the ingenious Mr Bewley's Mephitic Julep", but which we now call soda-water. The feature of Mr Bewley's julep was that the impregnated solution having been swallowed, it was immediately followed by a spoonful of lemon juice sweetened with sugar, whereby "... the fixed air was extricated in the stomach in much greater quantity..." Bewley's invention was widely regarded as of the greatest importance, since, for reasons that will shortly be discussed, it allowed the administration of a neutral solution, pleasant to the taste, that would readily dissociate in the body into its constituent acid and alkali, each of which could then produce its individual effects.

A further important step with far-reaching consequences was taken by Thomas Henry, the well-known doctor, friend and colleague of Thomas Percival, and founder of the famous chemical dynasty, the Henrys of Manchester. Henry was the first to use soda-water mixed with spirits as a drink, and one likes to think that he did this under the influence of the Brunonian doctrine of disease, and not for any frivolous purpose.

THE MEDICINAL USES OF ARTIFICIALLY IMPREGNATED WATERS

When considering the medical attitude to the use of impregnated waters we must try to see them in the light of the rapidly advancing chemical ideas of the times. The physicians of the late 18th century did not regard them simply as the pleasant sparkling drinks of

today, but as active chemical remedies with effects readily explainable on a chemical basis. The therapeutic applications can be considered broadly under three heads. First, perhaps rather surprisingly, they were used in the treatment of what were known as putrid diseases, which we would now call infections, that were characterized by putrefaction of the tissues. Second, for the treatment of bladder stone, a very common condition until the 19th century; and third, for all the other complaints, gout, arthritis and gastrointestinal disturbances, for which mineral waters were thought to be effective.

The rationale for its use in putrefactive conditions was what was known as Macbride's doctrine. This was a theory put forward in 1764 by David Macbride (1726-78), brother of Admiral John Macbride, an erstwhile naval surgeon and later an Edinburgh graduate. Macbride published in book form a collection of *Experimental Essays* that embraced, in a comprehensive hypothesis, the physiological work of Stephen Hales, to whom he pays frequent tribute. In this account the argument is very considerably simplified and greatly condensed (Macbride, 1764)¹⁷.

Hales had conducted many experiments on the liberation of gases from solids by the action of heat or acids, and from his studies he evolved the theory that the tiny particles that make up all solid substances, whether animal, vegetable or mineral, are held together by the Newtonian attractive forces of the fixed gas or "air" that they contain; "fixed" in the sense that it is in combination and no longer free to expand and escape, but not the specific "fixed air" of Joseph Black, because Hales did not distinguish between different types of "air". If this fixed air is liberated, either by heat or by acid, the solid will crumble to a powder. This observation was the basis of his own attempts to dissolve bladder stones (Clark-Kennedy, 1929)¹⁸.

Macbride, however, when he took up Hales's ideas, applied them in exactly the opposite sense, with the emphasis not on solution but on conservation, and with a particular application to medicine. If dissolution of substances, including vegetable and animal matter, was due to the loss of a gas, which he was able experimentally to identify specifically as Black's fixed air, or carbon dioxide, then putrefaction could be arrested, or even reversed, by exposure of the diseased tissues to the same gas. A number of diseases were regarded as putrefactive, including typhus, so-called putrid sore throat, various external ulcers, and, because of the rotting gums and leg ulcers, scurvy, and there are accounts of the use of impregnated

water in all these conditions. Macbride's doctrine, in fact, was one of the reasons for the delay in introducing the routine use of the lemon as an antiscorbutic by the British Navy until some 40 years after the demonstration of its effectiveness by Lind in 1753 (Lloyd and Coulter, 1961)¹⁹. Priestley published as an appendix to his *Experiments and Observations* some case reports sent to him by Percival, who had used impregnated water to treat hectic fever, so far without success, but had heard from Dr Matthew Dobson of Liverpool, who wrote on March 29, 1775 to report on four patients with severe putrid fevers, suffering from weakness, very rapid pulse, with brain much affected, and with large petechiae all over the body, who improved rapidly within 24-48 hours of commencing to drink the solution of fixed air, and recovered to the extent of being out of danger within 4-6 days.

Some interesting experiments were also carried out on the preservation of food from putrefaction, which of course was a problem in those days. These led directly from experiments reported by James Pringle in 1752, in his *Observations on the Diseases of the Army*, into the use of "antiseptics"²⁰, using the word to mean the counteracting of putrefaction. Following Pringle's work it seems that newly discovered substances were examined for this antiseptic property fairly routinely; thus Priestley, in 1774, commented on the remarkable antiseptic powers of nitrous oxide. Percival, and another of Priestley's correspondents, Sir William Lee, both reported that fruit and meat had been preserved from putrefaction in impregnated water in the middle vessel of a Nooth's apparatus. Lee also reported the successful treatment of violent putrid fever and a sore throat in a man, his wife and his child, all given up by the apothecary as likely to die within 24 hours. A further letter from Percival, of June 1, 1775, reveals the enthusiasm with which the new medicine was being used, and recounts its use for another very common and distressing condition, bladder stones. This line of therapy arose from the *in vitro* observation that some urinary calculi would gradually dissolve in a solution of fixed air²¹.

THE MEDICAL LITERATURE

Two books published about 1780 give emphasis to these aspects of the application of Nooth's apparatus. One was John Elliot's *Account of the principal mineral waters of Great Britain, Ireland, and the Continent*, published in 1781. This is the first book to advocate strongly the advantages of artificial over natural mineral waters. According to Elliot, the principal virtue of all mineral waters lies in their *volatile*

principle, and with modern techniques artificial waters can be made to contain more than double the amount of fixed air that is found in the strongest natural waters; and there is the additional advantage that the mineral content also can be controlled, and harmful constituents avoided. Elliot illustrates Nooth's apparatus in its various varieties and describes how to use it. He mentions that the artificial waters have been used with success in putrid fever, scurvy and dysentery, and that "water impregnated with fixed air is now known to be a powerful antiseptic, or corrector of putrefaction. It will preserve flesh kept in it sweet, and even restore it after it becomes putrid." The debt to Priestley is obvious. Elliot also describes how fixed air has been applied by means of a syringe to an ulcerated sore throat, and in cases of putridity it has been applied as a stream to the surface of the body. The idea of local application apparently originated from Priestley's friend, the Leeds surgeon, William Hey; so that in concept, at least, Lister's antiseptic spray had been anticipated by one hundred years. Elliot mentions also the inhalation of fixed air for purulent disease of the lungs, and in this he foreshadows the work of Thomas Beddoes, and points directly to one of the origins of the Pneumatic Institute at Clifton. Beddoes, in fact, who had followed Black in adopting the new chemical nomenclature of the French school, actually dedicated a book that he published in 1793 to "the discoverer of the virtues of Vegetable Alkali supersaturated with carbonic acid", and he mentions the value of Nooth's apparatus, although as a good socialist he regrets that it is only available to the well-to-do, and recommends instead pills compounded of soap and washing soda. Elliot's book must have been well received, for a second edition which included an expanded and much modernized section on the analysis of mineral waters was published in 1789.

The second book to be noted is Matthew Dobson's *A Commentary on Fixed Air*, published in 1779. Although he also was interested in systemic diseases, Dobson had been impressed by some experiments of Thomas Percival, whereby calculi placed in the middle vessel of a Nooth's apparatus had gradually dissolved. As a result, impregnated water had come to be much preferred to the previous remedy for bladder stones; this was lime-water, introduced about 1741 by Robert Whytt of Edinburgh, and taken in a dose of 3 pints a day. It had the disadvantage that it often nauseated the patient, destroyed his appetite and caused heartburn. Impregnated water was much more palatable, and was regarded as such an advance that Percival was

stimulated to write, "I cannot refrain from expressing heart-felt satisfaction that I enjoy the discovery of a new lithontriptic medicine, that is at once grateful to the palate, strengthening to the stomach, and salutary to the whole system." Matthew Dobson was concerned to ensure that impregnated water taken by mouth retained its carbon dioxide, and hence its activity, during its passage through the blood stream and the kidneys, and he was reassured to find that one of his patients was passing urine that gave a cloudy precipitate with lime-water; we are not told whether it also fizzed²².

Thus, there was a growing interest in the medicinal uses of carbon dioxide, both in solution and as a gas, and the *Philosophical Transactions of the Royal Society* contain no fewer than 25 communications on various aspects of this subject, mainly in connection with mineral waters, artificial and natural, between about 1765 and 1780.

THE FATE OF THE MACBRIDEAN DOCTRINE

Although Macbride's hypothesis served as a stimulus to the introduction of fixed air to therapeutics, it did not long survive the test of practical application. As early as 1771 it was attacked by an Edinburgh physician, William Alexander, after disappointing clinical experiences of the application of fermenting mixtures, which generated carbon dioxide locally, in the treatment of putrid diseases (Alexander, 1771)²³. Henry, Percival and Priestley, however, continued to support the idea, and Henry, who was already engaged in the commercial manufacture of a purified form of magnesia alba, which was sold as *Henry's Genuine Magnesia* in boxes for 1 guinea or ten shillings and sixpence soon saw the commercial possibilities of this product also. In 1782 he launched out into the large-scale commercial production of mineral or soda waters, and he held the field for a number of years; but in 1804 his son William, in a letter to James Watt junior, expressed concern, fully justified from his point of view, as time has shown, about the activities of one Schwebbe, who had established a factory in Bristol, and "is dispersing his partners over the country . . ." (Musson and Robinson, 1969)²⁴. It is clear that by the end of the 1780s Macbride's doctrine was being discarded, and impregnated water was being regarded as only artificial mineral water, or as a means of administering an acid solution in a palatable form; though it was not used any the less for that. It was, for example, a popular constituent of the various regimes against cholera recommended by doctors during the 1831-32 epidemic.

THE LATER CAREER OF DR NOOTH

Nooth himself may have been unaware of the subsequent development and use of his apparatus for some years, for his career took an unusual turn for someone with his qualifications and attainments. In 1775 he joined the medical services of the British Army, being appointed Physician Extraordinary and Purveyor, North America, on October 19. He served in America during the War of Independence, and remained on service abroad until 1784 (Johnston, 1917)²⁵.

On April 10, 1779 Nooth was appointed Superintendent General of Hospitals for the British Forces in North America; this post, the only one ever of its kind, was created to provide one person with the authority to resolve the differences between the regimental surgeons and the general hospitals. In this Nooth appears to have been reasonably successful. Although he was beset by clashes of personality among his staff, as can be gathered from his correspondence with Robert Adair, Inspector General of Military Hospitals²⁶, he was certainly able to avoid quarrels as destructive as those between Morgan and Shippen that devastated the hospital services of the Revolutionary Army (Bell, 1965)²⁷.

Among other things, the Adair-Nooth correspondence throws an interesting and amusing light on the postal and administrative arrangements during the war. On December 4, 1781 Adair wrote to Nooth, "I have received your letter of 13th October with the Duplicates. By directing to me at the War Office I save no Postage, but had Your Packet been put under a Cover addressed to the Secretary at War it would have come to me free of Expense." Later he complains bitterly of a letter that cost him 29 shillings. It seems that letters were written in triplicate and despatched at monthly intervals in case the first or second ship should fall into the hands of the French navy or be otherwise lost²⁸.

Among the problems that beset Nooth, quite apart from the recurrent one of supplies and expenditure, was one that vividly illustrates the great division that existed between the three "orders" of the medical profession before the Medical Act of 1858. This was the case of Dr Paine, apothecary, who, while on leave, ". . . having rather imprudently past an Examination before the College of Physicians, they insisted that he should no longer practice as an Apothecary as otherwise they would withhold the Sanction of a Degree. The Secretary at War in compassion to his circumstances as he had taken this unwary step was prevailed upon to allow him the liberty of practising as a

Physician instead of acting as an Apothecary, with this provision that whenever a Vacancy happened he should be appointed Physician, and his employment of Apothecary be given to Mr West." More information about Nooth's service during the American War of Independence is given in Cantlie's History of the Army Medical Services, where one reads that among the equipment that arrived at the New York military hospitals during 1780 "... there was a particular item of eight machines for impregnating water with fresh air" (Cantlie, 1974)²⁹.

At the conclusion of the war Nooth was left to wind up the general hospitals in New York. He returned to England in 1784, and during 1787 he lived for about 6 months at 28, Golden Square³⁰. Once at home, his scientific interests and inventiveness came again to the fore. Edmund Goodwyn, writing on the physiological requirements for effective artificial respiration in his book on resuscitation, describes a brass syringe of 100 cubic inches (about 1600 ml) capacity, the nozzle of which could be connected to a small tube inserted into the nose, larynx or trachea, and says in a footnote, "I am favoured with this instrument by Dr Nooth, a Gentleman distinguished as much for liberality as genius, to whom the Arts are indebted for several valuable inventions, which are commonly attributed to others" (Goodwyn, 1788)³¹.

Nooth rather reluctantly returned to Canada in 1788 at the personal request of the Governor General, Lord Dorchester, and an account of his life and service there has been compiled from the Canadian archives by a medical historian, Dr Gabriel Nadeau; but he could find no information about Nooth's birth or childhood, and speculated that because he graduated at Edinburgh he might be Scottish (Nadeau, 1945)³². Nooth became acquainted with Sir Joseph Banks, President of the Royal Society, during his stay in England, and on his return to Canada he corresponded with him and supplied him with botanical specimens. Their correspondence ranged widely; it included botany, the refining of maple syrup, the commercial production of potash, the exploitation of the vegetable dyes of the American Indians, some observations on the variations of the magnetic meridian at Quebec, and accounts of the unsettled political situation that had resulted from the influence of the French Revolution on the newly established United States.

Dr Nooth was undoubtedly the premier physician in Canada, and today he is remembered more by French-Canadian doctors than by his own compatriots. His eminence was such that he was called to attend Edward, Duke of Kent, who was later the father

of Victoria, after his fall from a horse in 1798, and he secured the Duke's gratitude by invaliding him home. Nooth himself returned to England towards the end of 1799, suffering from an illness that he expected to be fatal. He had gradually developed respiratory difficulty, an irregular pulse and paroxysms of fever. Shortly after arriving in London he visited the Theatre; the night was warm, the house was crowded, and an exacerbation of fever, irregularity of the pulse and a troublesome cough, obliged him to leave. He felt so ill that he did not expect to be alive next morning. "During the night, my respiration was very laborious, and my cough so extremely troublesome, that I slept very little. In the morning, when I attempted to get out of bed, the cough came on with such violence, that after many severe fits of it, I was, through fatigue, obliged to throw myself on the bed with my face downwards. In this position I remained some time, coughing occasionally with great violence, and spitting from time to time a considerable quantity of phlegm into my handkerchief. Perceiving accidentally that there was something very hard in the handkerchief, I was induced to examine it, and dividing it with my knife, I found it was a large shot, about the eighth of an inch in diameter. As the cough, soon after I expectorated this foreign body, was somewhat less frequent and less violent, I began to dress myself, and in a short time became so easy that I sat down to breakfast." He then remembered that shortly before his illness he had drunk some wine, a drop or two of which had "gone the wrong way", and he realized that the lead shot must have passed from the bottle into his glass, and thence into his trachea³³.

Nooth was appointed Physician to the Duke of Kent's Household in 1800. He remained in England, living for a short time at 7, Quebec Street, off Oxford Street, and then at Bath, where his youngest brother practised as a surgeon. He served in Gibraltar from 1805 to about 1809, and helped cope with the epidemic of yellow fever that was ravaging the southern parts of Spain. It is recorded that he courageously attended the worst cases himself, to prove his opinion that it was not contagious; he was now about 70 years of age, and the severity of the epidemic was such that 6000 people died in Gibraltar alone. Nooth appears on the Army List of 1809 as on half-pay, and he remained Physician to the Duke of Kent's Household until the Duke's death in 1820.

Little is known of Nooth's domestic circumstances. He had two sons, whose careers can be traced in the Army Lists, and at least one daughter. He

appears also to have had two wives³⁴. It is known that he lived at 9, Edward Street, Bath, in 1819, and at 12, Great Pulteney Street from 1824 until his death on May 3, 1828, in his 91st year. An obituary notice appeared in the *Bath Chronicle* of Thursday, May 8, 1828. In it, reference is made to Nooth's distinguished record of public service, his scientific and literary attainments, and the qualities of "integrity, candour, and benevolence which uniformly marked his conduct in every relation of his long and honourable life".

THE LATER HISTORY OF NOOTH'S APPARATUS

Nooth's apparatus appears to have become almost a household article, at least among the better off, and according to Magellan "many thousands" were sent abroad (Musson and Robinson, 1969)³⁵. Certainly there is one in excellent condition, but wrongly labelled as a "pharmaceutical apparatus of the mid-nineteenth century", in the medical museum, the Musée Scipion, in Paris. But although impregnated, carbonated or artificial mineral waters had probably declined into merely a pleasant, refreshing drink by the turn of the century, Nooth's apparatus itself seems to have been about, if not in daily use, for the next 40 or 50 years. It occupied pride of place in the illustration of the chemical apparatus used by Dr Babington in his demonstrations to the medical students of Guy's Hospital in 1816 (Wilks and Bettany, 1892)³⁶, and it was still to be seen on the shelves of one of the most famous pharmacies, that of Allen and Hanburys at Plough Court, as is shown by a photograph taken some time before 1868 (Cripps, 1927)³⁷. This might easily have been the end for Nooth's apparatus, to gather dust sadly on an upper shelf; but after 70 years of service it was yet to play its most historic role.

On Saturday, December 19, 1846, Peter Squire of Oxford Street, not merely "an instrument maker named Squire" (Armstrong Davison, 1965)³⁸, but a most distinguished member of the pharmaceutical profession, and the Queen's chemist and druggist, no less, was visited by his friend Robert Liston, senior surgeon at University College Hospital. Liston brought with him a letter from Boston, U.S.A., which gave an account of the first successful demonstration of surgical anaesthesia, by the inhalation of ether vapour, and he asked Squire to prepare for him a suitable apparatus so that he could try the method himself. He would like to have it quickly, as he had arranged to amputate a leg on Monday, 2 days hence.

No doubt Squire looked on his shelves, which may well have resembled those at Plough Court, and he

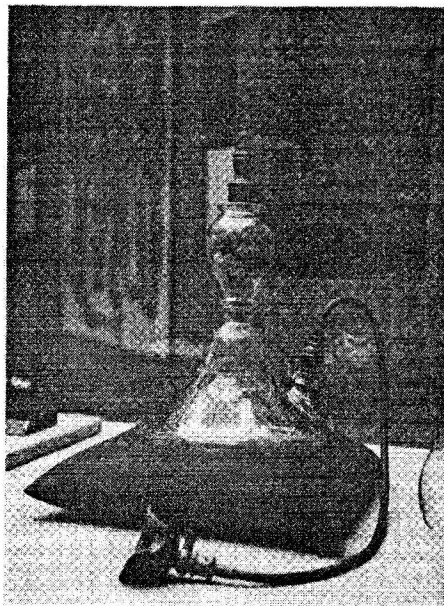


FIG. 6. Squire's Inhaler. (By courtesy of the Wellcome Trustees.)

chose as the essential part of his vaporizer the bottom part of a Nooth's apparatus. Into this he placed sponges to absorb the ether and assist vaporization, and he added a glass funnel, a valve to control the direction of air flow, a breathing tube, a ferrule for regulating the admixture of air, a mouthpiece and a nose clip; and this inhaler (fig. 6) was used by his nephew William, a medical student, to administer the first general anaesthetic for a surgical operation at University College Hospital, on Monday, December, 21, 1846 (Squire, 1847)³⁹.

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I am also grateful to Dr Edouard Desjardins, of Montreal, Editor-in-Chief, *L'Union Medicale du Canada*, and Dr Gabriel Nadeau, of Holden, Mass., for permission to quote from his paper on Nooth; to Dr John André, of Downsview,

Ontario, for information about the location of Nooth's will; to Mr Martin Moor, Medical Photographer, and Mrs Bridget Farrant, Librarian, the Postgraduate Medical Centre, Chase Farm Hospital; to my daughter, Miss Linda Zuck, for translations from the French, Italian and Latin; and to my secretary, Miss Eileen Massen.

I am also grateful to the North London Group of Anaesthetists, who awarded a B.O.C. Evershield Prize for a version of this paper. Those who, like the present writer, wallow in the joys of the past, will rejoice in the historical continuity that is being maintained by the British Oxygen Company, which in addition to Priestley's nitrous oxide and oxygen, and Black's fixed air, continues to supply also the modern, though much less versatile, domestic equivalent of Dr Nooth's apparatus.

NOTES AND REFERENCES

- Where no specific references are given, authority for the information contained in this section can be found in Partington, J. R. (1961). *A History of Chemistry*, Vol 2. London: Macmillan.
- Debus, A. G. (1965). *The English Paracelsians*. London: Oldbourne, p. 179, draws attention to the advances that had already been made in the methods of qualitative chemical analysis by the early 17th century, including the use of flame tests, colour indicators and crystal morphology.
- For Bacon's pungent criticism of the state of medicine in his times, and his caustic view of the circular progression of medical advances, see Bacon, F. (1605). *The Advancement of Learning*: World Classics Edition (1966), O.U.P., pp. 130-132. Although the concept of circularity in medical advancement was a potent and prophetic image to be using at this time, no one, so far, has suggested that Bacon wrote Harvey.
- Black, J. (1756). Experiments upon Magnesia Alba, Quicklime, and other Alkaline Substances; in *Essays and Observations, Physical and Literary. Read before a Society in Edinburgh and Published by them*, Vol. 2, pp. 157-225. (Reprinted by the Alembic Club, Edinburgh, Livingstone, 1963.) Black's work was apparently not known to Brownrigg.
- Brownrigg, W. (1756). An Experimental Enquiry into the Mineral Elastic Spirit, or Air, contained in Spa Water; as well as into the Mephitic Qualities of the Spirit. *Phil. Trans. R. Soc.*, 55, 218. Brownrigg can hardly be accused of rushing into print; he withheld his first paper from publication for 25 years, while waiting for the opportunity to further verify some of his observations. For further information about Brownrigg, who was a friend of Priestley and of Benjamin Franklin, see D.N.B.
- Priestley, J. (1775). *Experiments and Observations on Different Kinds of Air*, Vol. 2. London: J. Johnson. Except where otherwise indicated in the text, all further mention of Priestley's contributions refer to this work, especially pp. 263-303, and the appendices.
- John Mervin, in his will, which is held in the Dorset County archives, describes himself as of Sturminster Newton Castle. This is a ruined building on the hill immediately on the south side of the A 357 facing the stone bridge over the River Stour that leads to the town itself. It is described in one guide book (Hyams J. (1970). *Dorset*, p. 203. London: Batsford) as "the ruin not of a castle, but of a stone house, perhaps medieval", and an air of mystery does seem to hang over it. It seems reasonable to assume that this was Nooth's birthplace. When visited by the present writer in 1976 little more than one corner of the building, heavily overgrown, remained.
- Nooth's graduation thesis, "*De Rachitide*", is the earliest of the two surviving examples of his clinical writings, and the only source from which we can get some idea of his medical thought. It gives a clear exposition of the clinico-pathological features of the disease, and stands apart from the other writings of the times by disregarding the superstitions and irrational theories that had become attached to it. It shows evidence of careful observation and clear thought, and the ability to discount the irrelevant and go directly to what is significant. It was reprinted in Smellie's *Thesaurus*, and has been studied in recent years by Castellani, C. (1959). Una interessanta pubblicazione settacentesca sul rachitismo. *Mese Sanito*, 11, 9. Milan.
- Peck, T. W., and Wilkinson, K. D. (1950). *William Withering of Birmingham*. Bristol: John Wright and Sons. Withering's celebrated *Flora* was not among the books that Nooth, an enthusiastic botanist, later possessed, and Withering, when describing the apparatus for the production of impregnated water that he designed at the instigation of Priestley in 1781, made only a very oblique reference to Nooth's, which he did not even mention by name. In an age when everyone was generally most effusive in giving credit at the slightest opportunity to "his ingenious friend", these omissions are likely to be significant, and may indicate either personal indifference, or rivalry between the provincial scientists and the London group, or both.
- The Annual Register for the Year 1772*. London. "Characters", p. 83. Hamilton is most likely referring to Black's lime-water test, since Nooth's Edinburgh classmate, William Falconer, in a book published in 1772 on the medicinal uses of Bath water, gives a description of similar experiments that Nooth performed on the gas in the waters at Bath, in which the test is specified.
- Autobiography of Joseph Priestley* (1970), p. 89. Bath: Adams and Dart. Joseph Johnson, later of St Paul's Churchyard, was the great publisher of scientific and political books at the turn of the century.
- I am indebted to the Librarian, The Royal Society, for a copy of Nooth's certificate of candidature.
- Nooth, J. M. (1775). The Description of an Apparatus for impregnating Water with fixed Air; and of the Manner of conducting that Process. *Phil. Trans. R. Soc.*, 65, 59.
- Priestley, J. (1775). *op. cit.*, pp. 263-268. Priestley's lengthy account of this episode, which commences with a psychological analysis of the aberration that he attributes to Nooth on the question of priority, is most entertaining, and no doubt would be better known if Nooth himself had not been forgotten.
- In fairness to Priestley, however, it has to be pointed out that the necessity of economy dictated the simplicity of his apparatus; but this simplicity rendered his experiments easy to be repeated by others. (*Autobiography, op. cit.*, p. 95).

16. *Autobiography, op. cit.*, pp. 118–119.
17. Macbride, D. (1764). *Experimental Essays on . . . the Nature and Properties of Fixed Air . . . Antiseptics . . . Scurvy*. London. See also, Scott, E. L. (1970). The Macbridean Doctrine of Air. *Ambix*, 17, 43.
18. Clark-Kennedy, A. E. (1929). *Stephen Hales*, pp. 110–130. Cambridge: C.U.P. See also Hales's *Vegetable Staticks*, (1727), Oldbourne Book Co. reprint (1961), pp. 89–180; and *Haemastaticks* (1733), Hafner reprint (1964), pp. 250–281. Clark-Kennedy has diverted attention from Hales's work on bladder stone by describing it as "a hundred worthless pages" (*op. cit.*, p. 114). Anyone put off by this opinion will miss Hales's description of his double-lumen catheter, his instrument for extracting stones from the urethra, and the pipette, or dropping tube, which he appears to have invented. Hales was one of the "Trustees" who met in 1740 to enquire into the effectiveness of the remedy for bladder stone of Mrs Joanna Stephens, as a result of which she received £5000 from Parliament for disclosing a formula consisting mainly of calcined egg shells and garden snails. As much as this incident illustrates current ignorance and gullibility, it emphasizes also the desperation with which a cure for this condition was sought.
19. Lloyd, C., and Coulter, J. L. S. (1961). *Medicine and the Navy, 1200–1900*, Vol. 3, pp. 296–328. Edinburgh: Livingstone. See also Hughes, R. E. (1975), *Med. Hist.*, 19, 342, and Wyatt, H. V. (1976), *Med. Hist.*, 20, 433.
20. The use of the word "septic" in the times before the germ theory of disease opens up a very interesting field, into which we must not stray, but a comment by Pringle gives an indication of its meaning in his time: "Salt aids digestion by its septic quality, that is, by softening or resolving meats."
21. All these accounts, and others not quoted, are contained in Priestley, J. (1775), *op. cit.*, Priestley's friend William Hey, the Leeds surgeon, was one of the first to use carbon dioxide therapeutically.
22. In the third edition of this book, which was edited by Falconer after Dobson's death, he mentions a suggestion of Nooth's that it might be possible, for convenience and portability, to crystallize soda water; but he foresees the obvious technical difficulties.
23. Alexander, W. (1771). *An experimental enquiry concerning the causes which have generally been said to produce putrid diseases*. London.
24. Musson, A. E., and Robinson, F. (1969). *Science and Technology in the Industrial Revolution*, pp. 231–250. Manchester University Press. Henry's youngest son, William, "was one of the leading British scientists of the early nineteenth century, especially noted for his discoveries in pneumatic chemistry, including 'Henry's Law'."
25. Johnston, W. (1917). *Roll of Commissioned Officers in the Medical Services of the British Army*, p. 47. Aberdeen: University Press. The introduction gives information about the relative status of the various specialties and ranks. Army physicians were usually graduates, or had at least been licenced by the College of Physicians of London. They were the elite of the medical profession in the services, of higher status and with higher qualifications than the surgeons, and were much better paid. A Purveyor was responsible for the purchase and distribution of all food, drugs and medical comforts to hospitals; it was a well paid post, and much sought after, being normally a step in promotion after service as a medical officer. Nooth's simultaneous appointment to both posts was most unusual, and argues influence in high places.
26. Robert Adair is now remembered as "Robin Adair", in the song written by Lady Caroline Keppel, to whom he was married.
27. Bell, W. J. (1965). *John Morgan, Continental Doctor*. Philadelphia: University of Pennsylvania Press. There are passing references in this book to someone who is clearly Nooth.
28. The letters from Adair to Nooth are in the Public Records Office, W.O. 7–96. The conflict between the hospitals and the regimental surgeons is referred to in W.O. 4–275. For information about the organization of the medical services see Curtis, E. E. (1926). *The Organization of the British Army in the American Revolution*. New Haven: Yale University Press.
29. Cantlie, N. (1974). *A History of the Army Medical Department*, Vol. 1, pp. 148–162. Edinburgh: Churchill-Livingstone.
30. *Survey of London*, Vol. 31 (1963). The Parish of St James, Westminster Part II, North of Piccadilly, p. 161. London: Athlone Press; and *Rate Books for Golden Square, 1788*, Parish (Poor Rate), and Watch Rate, St James, Piccadilly: in Westminster Public Library.
31. Goodwyn, E. (1788). *The Connexion of Life with Respiration, or the Effects of Submersion, Strangulation, and Several Kinds of Noxious Airs*, p. 115. London: J. Johnson.
32. Nadeau, G. (1945). Un Savant Anglais à Québec à la fin du XVIII^e Siècle—Le Docteur John-Mervin Nooth. *Bulletin de l'Association des Médecins de Langue Française de l'Amérique du Nord*, 74, 3. Information about Nooth's stay in Canada is taken mainly from this paper; Nadeau is wrong, however, in saying that Nooth was created a Commander of the Most Honourable Military Order of the Bath by the Prince Regent in 1817. This honour was in fact bestowed upon his son, Lieut Col. John Mervin Nooth, of the 7th Regt of Foot, or Royal Fuzileers, who had served with distinction during the Peninsular War.
33. Nooth read an account of his illness to the Medico-Chirurgical Society of London on January 3, 1804. This was published under the title "A Case of a Disease of the Chest from a leaden Shot accidentally passing through the Glottis into the Trachea". *Trans. Medico-Chirurg. Soc. Lond.*, 3, 1.
34. Nooth's will is in the Public Records Office. It is characteristic of the difficulties of finding out anything about him that it is, unaccountably, not indexed, but it will be found in Fol. 371, PCC Sutton, 1828. His older son's statement of service to 1809 is in W.O. 25/747; he died in Demerara (now Georgetown), in 1823, and his will, also in the P.R.O., is a sad document.
35. Musson, A. E., and Robinson, E. (1969). *op. cit.*, p. 237.
36. Wilks, S., and Bettany, G. T. (1892). *A Biographical History of Guy's Hospital*. London: Ward, Lock, Bowden & Co.

37. Cripps, E. C. (1927). *Plough Court: The Story of a Notable Pharmacy*, facing page 100. London: Allen and Unwin.
38. Armstrong Davison, M. H. (1965). *The Evolution of Anaesthesia*, p. 117. Altrincham: Sherratt. The introduction of anaesthesia to this country has been very inaccurately described in all the standard histories of our specialty. The personal account of William Squire (*Lancet*, December 22, 1888, pp. 1220-1221), who actually administered the ether, has been ignored. However, Richard Ellis, in his series of papers that are appearing in *Anaesthesia*, is now providing an accurate and well-documented account of both persons and events. There is also a good brief account in Merrington, W. R. (1976). *University College Hospital and its Medical School: A History*, pp. 31-35. London: Heinemann. See also, Thorwald, J. (1957). *The Century of the Surgeon*, Ch. 2. London: Thames and Hudson.
39. Squire, P. (1847). *Pharmacol. J.*, 6, 350. Richard Gordon has an illustration of Squire's inhaler on the cover of his novel *The Sleep of Life* (1975, London: Heinemann). On page 136 Squire incorrectly describes Nooth's apparatus as having been designed by Priestley. A careful reading of the footnote on page 133 of Duncum, B. M. (1947). *The Development of Inhalation Anaesthesia*. London: O.U.P., would have prevented this error.

LE DR NOOTH ET SON APPAREIL

Le rôle de l'anhydride carbonique en médecine vers la fin du XVIII^e siècle

RÉSUMÉ

Les deux premiers inhalateurs conçus au Royaume-Uni pour l'administration d'anesthésie à l'éther (les appareils de Hooper et de Squire) comprenaient tous deux la partie inférieure d'un appareil de Nooth. Ce dernier, qui était auparavant un ustensile ménager, n'est plus guère mentionné maintenant que par un renvoi à une note figurant au bas d'un ou deux livres d'histoire spécialisés, tandis que Nooth, qui était un homme de médecine distingué et respecté en son temps, est maintenant virtuellement oublié. Il y a cependant de nombreux aspects de la vie de Nooth qui présentent un très grand intérêt et son appareil a été le tout premier qui ait été conçu pour produire ce que l'on peut appeler d'une manière générale des eaux carbonatées à

usage médical. Il existe donc, aussi surprenant que cela paraît, des liens solides de coïncidence entre l'histoire des eaux minérales artificielles et celui de l'anesthésie, ainsi qu'avec les objets mis en cause dans chaque cas.

DR. NOOTH UND SEIN APPARAT

Die Rolle von Kohlendioxyd in der Medizin des späten 18. Jahrhunderts

ZUSAMMENFASSUNG

Die beiden frühesten britischen Inhalatoren für die Verabreichung einer Äthernarkose (Apparate von Hooper und Squire) enthielten beide den unteren Teil eines Nooth-Apparates. Dieser einst weithin verwendete Apparat besteht heute nur mehr als Anmerkung in ein oder zwei medizinischgeschichtlichen Spezialwerken, und Nooth selbst, seiner Zeit ein hochangesehener Arzt, ist fast völlig vergessen. Viele Aspekte seines Lebens sind jedoch hochinteressant, und sein Apparat war einer der ersten für die Erzeugung kohlenstoffhaltigen Wassers; überraschenderweise bestehen starke Verbindungen zwischen der Geschichte künstlicher Mineralwässer und der von Narkose ebenso wie zwischen den daran beteiligten Persönlichkeiten.

EL DR NOOTH Y SU APARATO

El papel que desempeñó el dióxido de carbono en la medicina a fines del siglo dieciocho

SUMARIO

Los dos primeros inhaladores ideados para la administración de anestesia de éter en el Reino Unido (el aparato de Hooper y Squire) incluyeron ambos la porción inferior del aparato de Nooth. Este, que en un tiempo constituyó un objeto casero, es ahora recordado tan solo mediante una nota explicativa en uno o dos relatos históricos, y el mismo Nooth, que fue un médico muy distinguido y respetado en su época, ha quedado casi totalmente olvidado. Sin embargo hay numerosos aspectos de la vida de Nooth que son de gran interés, y este aparato fue uno de los primeros que fueron diseñados para producir, para propósitos médicos, lo que podrían llamarse inclusivamente aguas carbonatadas; y, sorprendentemente, existen fuertes vínculos coincidentes entre la historia de las aguas minerales artificiales y la de la anestesia, y las personas comprometidas en cada una.